AMENDMENTS TO THE CLAIMS

1.   (Previous Presented) A method for scoring a defect type of a pipe, the method comprising:

    receiving a defect type and an extent for the defect type of a pipe based on at least one defect of the pipe, the defect type having a defect category, a defect form, and a defect severity;

    providing a defect type score range from a base defect type score to a maximum defect type score, and a maximum extent that is specific to the defect type; and

    calculating a score for the defect type that is between the base defect type score and the maximum defect type score based on a relationship between the extent of the defect type and the maximum extent of the defect type.

2.   (Original) The method of claim 1 wherein the relationship is a ratio of the received extent of the defect type to the maximum extent of the received defect type.

3.   (Original) The method of claim 1 wherein the defect type is a continuous defect type and the maximum extent is segment length.

4.   (Original) The method of claim 3 wherein the received extent of the defect type is the length of the continuous defect of that defect type.

5.   (Original) The method of claim 3 wherein the score is calculated as follows:

$$DS_{C_i} = BDS_t + \left\{ (MDS_t - BDS_t)\left(\frac{DL_i}{SPL}\right) \right\}$$

where DS_{C_t} is the defect type score for the continuous defect type t of the pipe, BDS_t is the base defect type score for the defect type t, MDS_t is the maximum defect type score for the defect type t, DL_t is the extent of the continuous defect type t, and SPL is the maximum extent for the defect type t.

6.   (Previously Presented) The method of claim 1 wherein the defect type is a point defect type.

7.   (Original) The method of claim 6 wherein the maximum extent is a number of sections in the pipe.

8.   (Original) The method of claim 6 wherein the received extent of the defect type is the number of sections having defects of that defect type.

9.   (Original) The method of claim 6 wherein the score is calculated as follows:

$$DS_{P_t} = BDS_t + \left\{ (MDS_t - BDS_t) \left(\frac{min(ND_t, TDC_t)}{TDC_t} \right) \right\}$$

where DS_{P_t} is the defect type score for the point defect type t of the pipe, BDS_t is the base defect type score for the defect type t, MDS_t is the maximum defect type score for the defect type t, ND_t is the extent of the point defect type t, and TDC_t is the maximum extent for the defect type t.

10.   (Canceled)

11.   (Previously Presented) The method of claim 1 wherein the defect categories include crack.

12.   (Previously Presented) The method of claim 1 wherein the defect forms include longitudinal, circumferential, multiple, and spiral.

13.   (Previously Presented) The method of claim 1 wherein the defect severities include hairline, tight, and fracture.

14.   (Original) The method of claim 1 wherein the defect type has a defect group.

15.   (Original) The method of claim 14 wherein the defect groups include structural and maintenance.

16.   (Original) The method of claim 1 wherein a defect type score ranges from 0 to 100.

17.   (Original) The method of claim 1 wherein the base defect type score and the maximum defect type score vary based on material of the pipe.

18.   (Original) The method of claim 17 wherein the material is concrete, clay, brick, PVC, or metal.

19.   (Original) The method of claim 1 wherein a base defect type score, a maximum defect type score, and maximum extent are provided for each of a plurality of defect types and the received defect type is one of the plurality of defect types.

20.   (Original) The method of claim 1 wherein the defect type score is based on multiple defects of that defect type.

21.   (Previously Presented) The method of claim 20 wherein the extent of a defect type is the sum of the extent of each defect of that type limited to the maximum extent for that defect type.

22.   (Original) A method for grading a pipe having defects, the method comprising:

   providing a defect type score for each defect type of the pipe; and

   calculating a grade for the pipe that is based on a root-mean-square combination of a highest defect type score of the defect types and an average defect type score of the remaining defect types.

23.   (Original) The method of claim 22 wherein the calculating includes taking the square root of the average of the square of the highest defect type score and the square of the average defect type score.

24.   (Original) The method of claim 22 wherein the grading is calculated as follows:

$$SDG = \sqrt{\frac{maxDS^2 + \left[\dfrac{1}{n}\sum_{t=1}^{n} DS_t\right]^2}{2}}$$

where SDG represents a structural defect grade, DS_t is the defect type score for a continuous or point defect type t within the structural defect group, $maxDS$ represents the highest defect type score within DS_t, and n represents the number of all the structural defect types except the one with the highest defect type score.

25.   (Original) The method of claim 22 wherein the defect types include continuous and point defect types.

26.   (Original) The method of claim 22 wherein the defect types are in a defect group of structural.

27.   (Original) The method of claim 22 wherein the defect types are in a defect group of maintenance.

28.   (Original) The method of claim 22 wherein the defect types are in a defect group of structural or maintenance.

29.   (Original) The method of claim 22 wherein the grade is a pipe internal grade.

30.   (Original) The method of claim 22 wherein the grading is calculated as follows:

$$MDG = \sqrt{\frac{maxDS^2 + \left[\frac{1}{n}\sum_{t=1}^{n}DS_t\right]^2}{2}}$$

where MDG represents a maintenance defect grade, DS_t is the defect type score for a continuous or point defect type t in a defect group of maintenance, $maxDS$ represents the highest defect type score within DS_t, and n represents the number of maintenance defect types except the one with the highest defect type score.

31.   (Original) The method of claim 22 wherein the grading is calculated as follows:

$$IDG = \sqrt{\frac{maxDS^2 + \left[\frac{1}{n}\sum_{t=1}^{n}DS_t\right]^2}{2}}$$

where IDG represents an overall internal defect grade of the pipe, DS_t is the defect type score for a continuous or point defect type t, $maxDS$ represents the highest defect type score within DS_t, and n represents the number of defect types except the one with the highest defect type score.

32. (Original) The method of claim 31 wherein the defect types are in structural and maintenance defect groups.

33. (Original) The method of claim 22 wherein the providing of a defect type score includes:

   providing a base defect type score, a maximum defect type score, and a maximum extent for each defect type;

   receiving a defect type and an extent of each defect of the received defect type; and

   calculating a score for the defect type that is between the base defect type score and the maximum defect type score for the received defect type based on a relationship between a sum of the received extents of the defects and the maximum extent of the received defect type.

34. (Original) The method of claim 22 wherein the calculated grade is a primary grade including:

   calculating a secondary grade for each pipe in a group of pipes having the same highest defect type score; and

   adjusting the primary grade for the pipes in the group based on the calculated secondary grades.

35. (Original) The method of claim 34 wherein the calculating and adjusting is repeated for each group of pipes that have the same set of highest defect type scores.

36.   (Original) The method of claim 34 wherein the adjusted primary grades are within the lowest and highest primary grades initially calculated.

37.   (Original) The method of claim 34 wherein the primary grade of a pipe within the group is adjusted such that its value is the same fraction of the way from the lowest to the highest primary grade of the group as is its secondary grade is the way from the lowest to the highest secondary grade of the group.

38.   (Original) The method of claim 22 wherein a pipe includes conduit and appurtenances.

39.   (Original) The method of claim 22 wherein a pipe includes a conduit for stormwater or wastewater.

40.   (Original) The method of claim 22 wherein the pipe includes a manhole.

41.   (Original) A computing system for grading a pipe having defects, comprising:
a component that calculates a defect type score for each defect type of the pipe that is within a range defined by a base defect type score and a maximum defect type score, the defect type score being specific to the defect type and based on a relationship between a sum of the extents of the defects of the defect type and a maximum extent for the defect type; and
a component that calculates a grade for the pipe that is based on a combination of a highest defect type score of the defect type and an average defect type score of the remaining defect types.

42.   (Original) The computer system of claim 41 wherein the combination is a root-mean-square combination.

43.   (Original) The computer system of claim 41 wherein the calculating of the defect type score includes:

    providing the base defect type score, the maximum defect type score, and the

        maximum extent for each defect type; and

    receiving the extent for each defect of each defect type.

44.   (Original) The computer system of claim 41 wherein the calculating of the defect type score includes taking the square root of the average of the square of a highest defect type score and the square of the average defect type score of the defect type scores except the highest defect type score.

45.   (Original) The computer system of claim 41 wherein the grade is calculated as follows:

$$IDG = \sqrt{\frac{maxDS^2 + \left[\frac{1}{n}\sum_{t=1}^{n} DS_t\right]^2}{2}}$$

where IDG represents the overall internal defect grade of the pipe, DS_t is the defect type score for a continuous or point defect type t, $maxDS$ represents the highest defect type score of DS_t, and n represents the number of defect types except the one with the highest defect type score.

46.   (Original) The computer system of claim 41 wherein the base defect type score and the maximum defect type score for a defect type vary based on material of the pipe.

47.   (Original) The computer system of claim 46 wherein the material is concrete, clay, brick, PVC, or metal.

48.   (Original) The computer system of claim 41 wherein the defect type score for a continuous defect is calculated as follows:

$$DS_{C_t} = BDS_t + \left\{ (MDS_t - BDS_t) \left(\frac{DL_t}{SPL} \right) \right\}$$

where DS_{C_t} is the defect type score for the continuous defect type t of the pipe, BDS_t is the base defect type score for the defect type t, MDS_t is the maximum defect type score for the defect type t, DL_t is the total extent of the continuous defects of the defect type t, and SPL is the maximum extent of the defect type t.

49.   (Original) The computer system of claim 41 wherein the defect type score for a point defect is calculated as follows:

$$DS_{P_t} = BDS_t + \left\{ (MDS_t - BDS_t) \left(\frac{min(ND_t, TDC_t)}{TDC_t} \right) \right\}$$

where DS_{P_t} is the defect type score for the point defect type t of the pipe, BDS_t is the base defect type score for the defect type t, MDS_t is the maximum defect type score for the defect type t, ND_t is the total extent of the point defects of defect type t, and TDC_t is the maximum extent of the point defect type t.

50.   (Original) A method for grading a pipe having defects, the method comprising:

providing a defect type score for each defect type of the pipe; and

calculating a grade for the pipe that is based on a geometrically smaller weight being used from the highest defect type score to the lowest defect type score of the pipe.

51.　(Original) The method of claim 50 wherein each weight is one-hundredth of the weight of the next higher grade.

52.　(Original) The method of claim 50 wherein the grading is calculated as follows:

$$SDG_g = \sum_{t=1}^{m} \frac{DS_t}{(100)^{t-1}}$$

where SDG_g represents the structural defect grade based on a geometric weighting, DS_t is the defect type score for a continuous or point defect of the defect type t (DS_{C_t} or DS_{P_t}) in the structural defect group, and m represents all the structural defect types ordered from highest to lowest defect type score.

53.　(Original) The method of claim 50 wherein the grading is calculated as follows:

$$MDG_g = \sum_{t=1}^{m} \frac{DS_t}{(100)^{t-1}}$$

where MDG_g represents the maintenance defect grade based on a geometric weighting, DS_t is the defect type score for a continuous or point defect type t (DS_{C_t} or DS_{P_t}) in the maintenance defect group, and m represents all the maintenance defect types ordered from highest to lowest defect type score.

54.　(Original) The method of claim 50 wherein the grading is calculated as follows:

$$PSIG_g = \sum_{t=1}^{m} \frac{DS_t}{(100)^{t-1}}$$

where $PSIG_g$ represents the pipe segment internal grade based on a geometric weighting, DS_t is the defect type score for a continuous or point defect type t (DS_{C_t} or DS_{P_t}) in the pipe segment interval group, and m represents all the defect types ordered from highest to lowest defect type score.

55.   (Original) The method of claim 50 wherein the pipes are ranked by sorting their defect type scores so that the pipes with the highest defect type scores are ranked first and, when pipes have the same highest defect type score, they are ranked relative to each other based on their second highest defect type scores.

56.   (Original) A method for grading a pipe having defects, the method comprising:

providing a defect type score for each defect type of the pipe; and

calculating a grade for the pipe that is within a limit and that is based on a highest defect type score of the pipe combined with a secondary score derived from remaining defect type scores of the pipe.

57.   (Original) The method of claim 56 wherein a maximum secondary score is the difference between the limit and the highest defect score type.

58.   (Original) The method of claim 57 wherein the secondary score is calculated by multiplying the maximum secondary score by a secondary factor.

59.   (Original) The method of claim 58 wherein the secondary factor is score-based.

60.   (Original) The method of claim 59 wherein the score-based secondary factor is a logarithm of a ratio of a total of the defect type scores of the remaining defect types and a total of the maximum defect type scores of all defect types.

61.   (Original) The method of claim 58 wherein the secondary factor is count-based.

62.   (Original) The method of claim 61 wherein the score-based secondary factor is a logarithm of a ratio of a count of the remaining defect types and a total of all defect types.

63.   (Original) The method of claim 58 wherein the secondary factor is a combination of a score-based secondary factor and a count-based secondary factor.

64.   (Previously Presented) A system for scoring a defect type of a pipe, comprising:
        a component that receives a defect type and an extent for the defect type of a pipe based on at least one defect of the pipe, the defect type having a defect category, a defect form, and a defect severity;
        a component that provides a defect type score range from a base defect type score to a maximum defect type score, and a maximum extent that is specific to the defect type; and
        a component that calculates a score for the defect type that is between the base defect type score and the maximum defect type score based on a relationship between the extent of the defect type and the maximum extent of the defect type.

65. (Previously Presented) The system of claim 64 wherein the relationship is a ratio of the received extent of the defect type to the maximum extent of the received defect type.

66. (Previously Presented) The system of claim 64 wherein the defect type is a continuous defect type and the maximum extent is segment length and the score is calculated as follows:

$$DS_{C_t} = BDS_t + \left\{ (MDS_t - BDS_t) \left(\frac{DL_t}{SPL} \right) \right\}$$

where DS_{C_t} is the defect type score for the continuous defect type t of the pipe, BDS_t is the base defect type score for the defect type t, MDS_t is the maximum defect type score for the defect type t, DL_t is the extent of the continuous defect type t, and SPL is the maximum extent for the defect type t.

67. (Previously Presented) The system of claim 64 wherein the defect type is a point defect type and the maximum extent is a number of sections in the pipe and the score is calculated as follows:

$$DS_{P_t} = BDS_t + \left\{ (MDS_t - BDS_t) \left(\frac{min(ND_t, TDC_t)}{TDC_t} \right) \right\}$$

where DS_{P_t} is the defect type score for the point defect type t of the pipe, BDS_t is the base defect type score for the defect type t, MDS_t is the maximum defect type score for the defect type t, ND_t is the extent of the point defect type t, and TDC_t is the maximum extent for the defect type t.

68. (Previously Presented) The system of claim 64 wherein the defect type score is based on multiple defects of that defect type and the extent of a defect type is a

sum of the extent of each defect of that type limited to the maximum extent for that defect type.

69.   (Previously Presented) A system for scoring a defect type of a manhole, comprising:

a component that receives a defect type and an extent for the defect type of a manhole based on at least one defect of the manhole, the defect type having a defect category, a defect form, and a defect severity;

a component that provides a defect type score range from a base defect type score to a maximum defect type score, and a maximum extent that is specific to the defect type; and

a component that calculates a score for the defect type that is between the base defect type score and the maximum defect type score based on a relationship between the extent of the defect type and the maximum extent of the defect type.

70.   (Previously Presented) The system of claim 69 wherein the relationship is a ratio of the received extent of the defect type to the maximum extent of the received defect type.

71.   (Previously Presented) The system of claim 69 wherein the defect type is a continuous defect type and the maximum extent is segment length and the score is calculated as follows:

$$DS_{C_t} = BDS_t + \left\{ (MDS_t - BDS_t) \left(\frac{DL_t}{SPL} \right) \right\}$$

where DS_{C_t} is the defect type score for the continuous defect type t of the manhole, BDS_t is the base defect type score for the defect type t, MDS_t is the maximum defect type score

for the defect type *t*, DL_t is the extent of the continuous defect type *t*, and *SPL* is the maximum extent for the defect type *t*.

72.   (Previously Presented) The system of claim 69 wherein the defect type is a point defect type and the maximum extent is a number of sections in the manhole and the score is calculated as follows:

$$DS_{P_t} = BDS_t + \left\{ (MDS_t - BDS_t) \left(\frac{min(ND_t, TDC_t)}{TDC_t} \right) \right\}$$

where DS_{P_t} is the defect type score for the point defect type *t* of the manhole, BDS_t is the base defect type score for the defect type *t*, MDS_t is the maximum defect type score for the defect type *t*, ND_t is the extent of the point defect type *t*, and TDC_t is the maximum extent for the defect type *t*.

73.   (Previously Presented) The system of claim 69 wherein the defect type score is based on multiple defects of that defect type and the extent of a defect type is a sum of the extent of each defect of that type limited to the maximum extent for that defect type.

74.   (Previously Presented) A system for grading a manhole having defects, comprising:

    a component that provides a defect type score for each defect type of the manhole; and

    a component that calculates a grade for the manhole using an algorithm selected from the group consisting of:

        a root-mean-square combination of a highest defect type score of the defect types and an average defect type score of the remaining defect types;

a geometrically smaller weight being used from the highest defect type score to the lowest defect type score of the manhole; and

a highest defect type score of the pipe combined with a secondary score derived from remaining defect type scores of the pipe.

75.　　(Previously Presented) The system of claim 74 wherein the component that calculates a grade calculates as follows:

$$SDG = \sqrt{\frac{maxDS^2 + \left[\frac{1}{n}\sum_{t=1}^{n}DS_t\right]^2}{2}}$$

where SDG represents a structural defect grade, DS_t is the defect type score for a continuous or point defect type t within the structural defect group, $maxDS$ represents the highest defect type score within DS_t, and n represents the number of all the structural defect types except the one with the highest defect type score.

76.　　(Previously Presented) The system of claim 74 wherein the component that calculates a grade calculates as follows:

$$MDG = \sqrt{\frac{maxDS^2 + \left[\frac{1}{n}\sum_{t=1}^{n}DS_t\right]^2}{2}}$$

where MDG represents a maintenance defect grade, DS_t is the defect type score for a continuous or point defect type t in a defect group of maintenance, $maxDS$ represents the highest defect type score within DS_t, and n represents the number of maintenance defect types except the one with the highest defect type score.

77.   (Previously Presented) The system of claim 74 wherein the component that calculates a grade calculates as follows:

$$IDG = \sqrt{\frac{maxDS^2 + \left[\frac{1}{n}\sum_{t=1}^{n}DS_t\right]^2}{2}}$$

where IDG represents an overall internal defect grade of the pipe, DS_t is the defect type score for a continuous or point defect type t, $maxDS$ represents the highest defect type score within DS_t, and n represents the number of defect types except the one with the highest defect type score.

78.   (Previously Presented) The system of claim 74 wherein the component that calculates a grade calculates as follows:

$$SDG_g = \sum_{t=1}^{m}\frac{DS_t}{(100)^{t-1}}$$

where SDG_g represents the structural defect grade based on a geometric weighting, DS_t is the defect type score for a continuous or point defect of the defect type t (DS_{C_t} or DS_{P_t}) in the structural defect group, and m represents all the structural defect types ordered from highest to lowest defect type score.

79.   (Previously Presented) The system of claim 74 wherein the component that calculates a grade calculates as follows:

$$MDG_g = \sum_{t=1}^{m}\frac{DS_t}{(100)^{t-1}}$$

where MDG_g represents the maintenance defect grade based on a geometric weighting, DS_t is the defect type score for a continuous or point defect type t (DS_{C_t} or DS_{P_t}) in the

maintenance defect group, and *m* represents all the maintenance defect types ordered from highest to lowest defect type score.

80.   (Previously Presented) The system of claim 74 wherein the component that calculates a grade calculates as follows:

$$PSIG_g = \sum_{t=1}^{m} \frac{DS_t}{(100)^{t-1}}$$

where $PSIG_g$ represents the pipe segment internal grade based on a geometric weighting, DS_t is the defect type score for a continuous or point defect type t (DS_{C_t} or DS_{P_t}) in the pipe segment interval group, and *m* represents all the defect types ordered from highest to lowest defect type score.